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Arianna Wright Rosenbluth

Brief article discussing the contributions of Dr. Arianna Wright Rosenbluth to work done at Los Alamos and to computer science in general.

Arianna Wright Rosenbluth: Innovative physicist built foundation for modern computer science
Last surviving author of seminal paper on Metropolis algorithm passes away

Arianna Wright Rosenbluth – former Los Alamos physicist and last surviving contributor to the seminal 1953 paper "Equation of State Calculations by Fast Computing Machines" on the first uses of what is now known as the Metropolis algorithm – passed away in December 2020 at age 93 from COVID-19 related causes.

The Metropolis algorithm is a Markov chain Monte Carlo method that continues to be foundational in the modern world of computer science. Its applications today range from weather forecasting to climate change modeling, computer graphics, AI, economic analysis, and more.

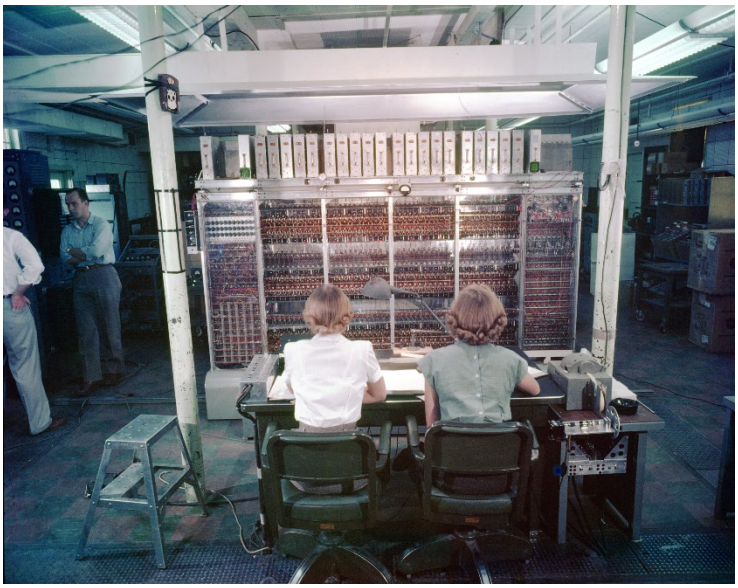
"The Metropolis algorithm enabled the application of the Monte Carlo method to a broad class of problems to which the original Monte Carlo techniques of Ulam and von Neumann were inapplicable. Its simplicity facilitated the eventual spread of its use throughout the quantitative sciences and engineering and even in the social sciences and humanities. It helped establish the Monte Carlo method as a "go-to" method for understanding large, complex problems," explains **Jim Gubernatis** of T-4.

Early years

Growing up in Texas, Rosenbluth showed an affinity for science at an early age. She graduated with a bachelor's in physics from Rice University at age of 18 and a master's in physics from Radcliffe College a year later. In 1947, she began working on her doctorate at Harvard University, where she studied under **John Van Vleck**, who won the Nobel Prize in Physics in 1977.

Rosenbluth completed her thesis under Van Vleck in February 1949 on the subject of paramagnetic relaxation. Following graduation, she took a postdoc position working for the Atomic Energy Commission under physicist **Felix Bloch**, who won the Nobel Prize in Physics in 1952.

Ivy Mike, MANIAC and other important work



The MANIAC machine at Los Alamos, circa 1952. This photo is part of the collections at the lab's National Security Research Center.

Arianna was offered a position at what was then known as the Los Alamos Scientific Laboratory (LASL) in 1950, and married fellow physicist **Marshall Rosenbluth** in 1951. Soon after, the two collaborated on calculations for Ivy Mike – the codename given to the first full-scale test of a thermonuclear device, which occurred at Enewetak Atoll – using the Standards Eastern Automatic Computer (or Standards Electronic Automatic Computer) at the National Bureau of Standards in Washington, D.C.

At LASL, Arianna and Marshall continued working together on problems involving early computers, including MANIAC – one of the first computers built under

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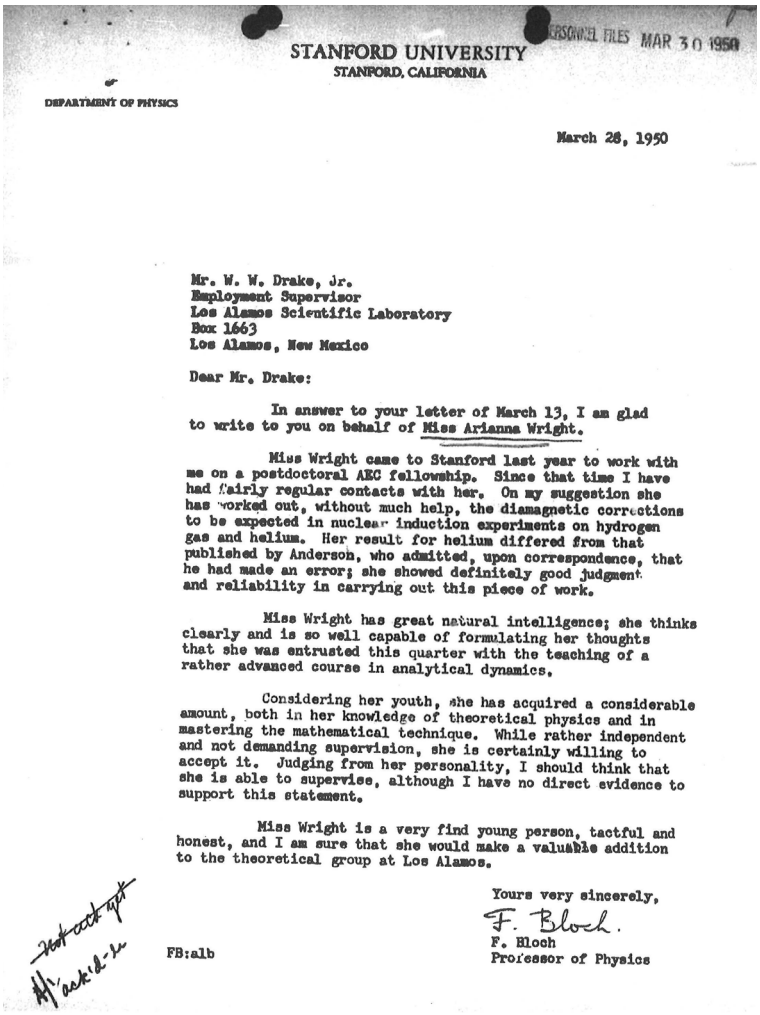
the direction of famed Manhattan Project physicist **Nicholas Metropolis**.

With MANIAC, the Rosenbluths, along with **Edward** and **Augusta Teller** and Metropolis developed an advanced statistical problem-solving method they called the Metropolis Algorithm.

Arianna played a large role in the work, programming the computer implementation of the algorithm. In 1953, Metropolis, the Rosenbluths, and the Tellers penned and published the aforementioned "Equation of State Calculations by Fast Computing Machines."

Although her contributions were instrumental to the success of the project, until recently, Arianna's contributions have often been overlooked. In fact, Arianna was able to successfully program and run the algorithm almost single-handedly.

In June of 1956, Arianna quit working at LASL. The Rosenbluth family moved to California, where Marshall worked at General Atomic. Despite her previous success, Arianna did not return to work, instead choosing to stay at home to raise her children.



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STANFORD, CALIFORNIA

DEPARTMENT OF PHYSICS

PERSONNEL FILES MAR 30 1950

March 28, 1950

Mr. W. W. Drake, Jr.
Employment Supervisor
Los Alamos Scientific Laboratory
Box 1663
Los Alamos, New Mexico

Dear Mr. Drake:

In answer to your letter of March 13, I am glad to write to you on behalf of Miss Arianna Wright.

Miss Wright came to Stanford last year to work with me on a postdoctoral AEC fellowship. Since that time I have had fairly regular contacts with her. On my suggestion she has worked out, without much help, the diamagnetic corrections to be expected in nuclear induction experiments on hydrogen gas and helium. Her result for helium differed from that published by Anderson, who admitted, upon correspondence, that he had made an error; she showed definitely good judgment and reliability in carrying out this piece of work.

Miss Wright has great natural intelligence; she thinks clearly and is so well capable of formulating her thoughts that she was entrusted this quarter with the teaching of a rather advanced course in analytical dynamics.

Considering her youth, she has acquired a considerable amount, both in her knowledge of theoretical physics and in mastering the mathematical technique. While rather independent and not demanding supervision, she is certainly willing to accept it. Judging from her personality, I should think that she is able to supervise, although I have no direct evidence to support this statement.

Miss Wright is a very find young person, tactful and honest, and I am sure that she would make a valuable addition to the theoretical group at Los Alamos.

Yours very sincerely,
F. Bloch.
F. Bloch
Professor of Physics

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A letter of recommendation for a position at Los Alamos Scientific Laboratory written for Arianna Wright in 1950 by future Nobel Laureate Felix Bloch.